



THINKING GREEN

***A Guide to
the Benefits
and Costs of
Greenways
and Trails***



This publication was prepared based on information from the report *Assessing Community Impacts from Greenways: Recommendations for Identifying, Measuring and Estimating the Benefits and Costs of Corridors* written by The Center for International Public Management, Inc. for the Florida Department of Environmental Protection, Office of Greenways and Trails, February 1998. This publication was funded through a grant from the Florida Department of Community Affairs.

The full report and this summary can be found on the World Wide Web at: <http://www.dep.state.fl.us/gwt>

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Florida greenways and trails — Helping communities “think green”

Greenways and trails offer tremendous benefits to communities, and nowhere is that more true than here in Florida. No other concept has done as good a job of recognizing and incorporating the needs of conservation supporters, recreation groups and economic organizations. No other concept so embraces the interconnectedness of all these aspects of our communities. The simple truth is, greenways and trails are good for communities. They're good for the environment, they're good for business, they are excellent recreation resources and wonderful natural amenities.

The term *greenway* encompasses a broad range of natural and man-made corridors. According to the Florida Greenways Commission, the Department of Environmental Protection (DEP) and the Florida Greenways Coordinating Council, “a greenway is a corridor of protected open space that is managed for conservation and/or recreation. The common characteristic of greenways is that they all go somewhere. Greenways follow natural land and water features, like ridges or rivers, or human landscape features like abandoned railroad corridors or canals. They link natural reserves, parks, cultural and historic sites with each other and, in some cases, with populated areas. Greenways not only protect environmentally sensitive lands and wildlife, but also can provide people with access to outdoor recreation and enjoyment close to home.” Trails are linear corridors on land or water with public access for recreation or transportation.

Greenways and trails come in all shapes and sizes. On the state and regional level, government and private groups are working together to preserve large corridors that define Florida's “green infrastructure.” But

greenways and trails are often local projects, driven by neighborhood associations, local environmental and trail user groups or sometimes even individuals who know and love a specific green space.

Working together, DEP, the Florida Greenways Coordinating Council and the Florida Recreational Trails Council coordinate activities and provide technical assistance to communities, providing financial support and expertise to projects designed to link existing urban and rural open space into a comprehensive, statewide system of greenways and trails. They are helping communities all over the state “think green.”

The truth about greenways and trails

A lot has been written in the past decade about greenways and trails. Publications have been devoted to their environmental benefits, their recreation benefits, their cultural/historic benefits. Writers have told us how to create them, why they're important, and why we should have them.

What's been lacking is a study that looks objectively at existing greenways and trails, evaluates their impacts and considers their costs.

That's why, in the fall of 1996 DEP asked the Center for International Public Management to do a study of greenway and trail literature from around the U. S. focusing on how greenways and trails affect communities in three areas: economic, ecological, and human/cultural. This is a summary of the center's final report. It includes a short look at the benefits and costs of greenways and trails in each of the three areas, and concludes with a worksheet intended to help local leaders identify and analyze the benefits and costs of greenways and trails projects.





Economic impacts

Economic impacts are those involving monetary costs or benefits to members of the community, property owners, local businesses, and the public treasury, and are often the major impacts considered in evaluations of proposed corridors.

Economic benefits

Many economic benefits have been quantified in studies about the effects greenways and trails have on communities. These include:

Increased economic activity

Local hotels, restaurants and other businesses benefit from increases in tourist activity and increased spending on durable goods such as bikes or skates, and soft goods such as gasoline, food, and drinks. Property owners also can benefit since greenways and trails may increase the value of properties adjacent to the corridor, particularly where greenways with trails pass through residential neighborhoods.

Economic development is an important local issue, and many studies of greenways with trails have sought to estimate and report the level of expenditures made by users. Typically, these estimates are based on surveys that ask for information on the frequency and duration of trail use, and on total expenditures made during or in preparation for the trip. They ask trail visitors about the amount and location of expenditures on durable goods such as bikes or skates, and on soft goods such as gasoline, food, and drinks. Tourists are also usually surveyed about their expenditures at local hotels and/or restaurants.

The National Park Service study

The most comprehensive study to date, conducted by the National Park Service, provides relatively detailed per-trip expenditure data for three rail-trails from May 1990 to February 1991: The Heritage Trail in eastern Iowa, the Lafayette/Moraga Trail in northern California, and the St. Marks Trail outside of Tallahassee, Florida. (See the chart above.) This study found that restaurant and auto-related expenditures were the largest trip-related expenditures, and visitors staying at least one night in the area generated the largest



Rail-Trail expenditures

Average Expenditures per single use:

Local Trails:

1. \$3.97/person for 7.6 mile Lafayette/Moraga Trail, CA

Regional Trails:

1. \$11.02/person for 16-mile St. Marks Trail, FL
2. \$9.21/person for 26-mile Heritage Trail, IA
3. \$9.04/person for 23.5-mile Sugar River Trail, WI
4. \$14.88/person for 32-mile Elroy-Sparta Bicycle Trail, WI

State Trails:

1. \$7.94/person for Heartland Trail, MN (no length reported)
2. \$9.71/person for Root River Trail, MN (no length reported)
3. \$1.90/person for Douglas Trail, MN (no length reported)
4. \$8.38/person for Munger St. Trail, MN (no length reported)

Source: National Park Service

average expenditures. Trail-related equipment, such as bicycles and skates, represented the single largest source of expenditures at all three greenways.

The National Park Service study provides





Non-consumptive fees

Community greenways that have benefitted from non-consumptive fees include:

- **Wisconsin.** U.S. Telecom paved the 48-mile Glacial Drumlin Trail (a \$375,000 value) in return for a perpetual 10-foot wide easement.
- **Seattle/King County, Washington.** The Parks Dept. gave a 5-year renewable lease to U.S. Sprint on a 2.25-mile rail trail. The fee increases 10 percent each year.
- **Northern Virginia, Washington and Old Dominion Railroad Regional Park** 45-mile multi-use trail. The Regional Park Authority gets \$450,000 per year from fiber-optic license fees, one-time and recurring rental fees (primarily for businesses using adjacent property), and administrative and review fees. Adjacent property owners pay \$25/year for use of garden plots in the right-of-way.
- **Montgomery County, Maryland.** The local power company paid \$1,000 to develop a portion of the Capital Crescent Trail in exchange for placing power lines near the corridor.
- **San Francisco, California.** A development company paid \$350,000 to pave part of the Iron Horse Regional Trail in exchange for permission to build an office complex nearby.

Source: *Rails to Trails Conservancy, 1993*

information about the relationship between trail-related expenditures and characteristics of the trails. The shorter, urban Lafayette/Moraga Trail (7.6 miles) may have had smaller per person expenditure levels than did the longer, more rural Heritage Trail (26 miles), but this “neighborhood” trail was used more often than either of the other two trails, so it generated a higher than expected economic impact. While the Heritage Trail had a higher per person expenditure than did the Lafayette/Moraga Trail, it generated a smaller annual economic impact. The medium length St. Marks Trail (16 miles) had both relatively high levels of per person expenditures and frequent trips, leading to substantial economic impacts for the area.

The study shows that expenditures by trail users are particularly affected by how far users must travel to get to the trail, how long they will stay, and what types of lodging they use. These factors depend upon trail features such as overall length, predominant setting, and extent of recreational activities supported by the trail.

Other economic studies

These basic conclusions are supported by findings from other studies. The U.S. Forest Service conducted a study of nineteen Illinois bicycle trails from April through October 1989. The trails chosen for the study ranged from .75 to 55 miles in length, and varied by trail surface (asphalt paving and crushed limestone) and geographical setting (urban, urban/suburban, and rural). All the trails were considered multi-purpose pedestrian and bike trails, with a few also allowing horseback riding. The study found that the users of these 19 trails spent, on average, \$2.89 per person per trip, with 53 percent reporting no expenditures and two percent spending over \$50. Respondents engaging in horseback riding activities reported slightly higher average expenditure levels than did other users. Like the findings of the National Park Service report, this study found that shorter, more urban trails generated the lowest per person expenditures, averaging \$1.15 for the 19 trails, while the longer, mostly rural trails averaged \$72.79 per trip. While local users



typically spent less per trip, they were likely to use the trail far more often than their counterparts on the longer trails.

Reduced costs to government

Another commonly cited benefit of greenways is that they can reduce costs to local government because property used for a greenway is not developed in some other way, resulting in fewer public outlays for services such as sewers, roads, and school facilities. This concept has three elements:

Infrastructure spending

First, it is often argued that preserving open space reduces spending on infrastructure because it forces development to occur in a smaller area. In other words, while the same amount of development occurs, it takes place in a denser fashion, costing the municipality less to provide services than when homes are spread out over larger areas. (See the chart, page 8.)

Growth management

The second way greenways can reduce costs to local government is if greenway conservation is accomplished as part of a growth management plan that reduces population growth. This would reduce the cost of building and maintaining additional schools, constructing and maintaining additional public facilities such as water and sewage, solid waste disposal, and parks, providing additional public services such as fire and police protection and health and welfare, constructing and maintaining additional roads and parking facilities, and administering goods and services.

Hazard mitigation and pollution control

The third reduced cost to local government comes in hazard mitigation and pollution control. Greenways can provide natural solutions to pollution control and hazard mitigation for problems such as flooding and slope instability. Governments can save money if they use these natural solutions rather than constructing expensive flood-control systems.



A question of property values

People who own property bordering a proposed greenway sometimes are concerned that development of a trail will lower their property values and lead to increased crime. But studies of greenway impacts on residential neighborhoods consistently show that trails have very little impact on the value of property bordering the greenway. In fact, trails often increase the value of property near, but not directly on, a greenway.

These results are borne out by several studies, including: a 1995 study of three greenways in the metropolitan Denver area, a 1987 study of the Burke-Gilman Trail in Seattle, a 1994 study of two Minnesota rail-trails, and a 1992 study by the National Park Service that looked at the St. Marks Trail outside Tallahassee, the Heritage Trail in eastern Iowa, and the Lafayette/Moraga Trail in northern California.



Photo courtesy of Greenways, Incorporated.



Reduced public service requirements

Existing estimates for public service costs include:

1. \$0.19 spent for each \$1 of tax revenue to serve farm/forest/open space or industrial/commercial land vs. \$1.25 for each \$1 of tax revenue to serve residential lands. (Vance and Larson, 1988)
2. \$0.35 spent for each \$1 of tax revenue to serve farm/forest/open space, \$0.37 spent for each \$1 of tax revenue to serve industrial/commercial land vs. \$1.15 for each \$1 of tax revenue to serve residential lands in Connecticut, Massachusetts, and New York. (American Farmland Trust, 1993)
3. \$700 per dwelling to serve high-density development (more than 4.5 units/acre) vs. \$2,200 per dwelling to serve low-density development (1 unit/1 to 5 acres). (American Farmland Trust, 1986)

Improved bond rating

Bond ratings reflect the financial community's faith in the ability of a government to meet its future obligations and manage its debts, and efforts to limit the costs of development through the preservation of open space have been viewed favorably by rating agencies. Development limits are thought to demonstrate a community's commitment to maintaining quality of life and controlling the costs associated with develop-

ment. For example, Howard County, Maryland received a AAA bond rating in 1990 on the issuance of \$55 million in bonds for capital improvement largely due to its program for limiting and managing growth.

The benefit of bond rating improvement is somewhat unconventional, because it arises from the perception that, by limiting growth, a community is improving its long-term fiscal condition. In communities where this benefit has been realized, a conscious decision has been made to use open space preservation to control future growth. Thus, the existence of an explicit and obvious local program to control and/or limit growth is likely to be a critical factor in whether or not this benefit is realized.

Increased revenues to government

Greenways and trails can increase revenues to local government in three ways:

Sales tax

New or additional sales tax revenues are expected to arise from purchases by both tourists and local greenway and trail users, so this benefit is directly related to tourism and other economic impacts. Because all greenways and trails are not the same when it comes to generating economic activity, tax benefits will vary from site to site.

Property tax

Increased property tax revenues result from increased property values, both in residential property near the greenway and in commercial property that benefits from greenway and trail users. Because greenways and trails often cross political jurisdictions, benefits from increased property values, economic development and tourism may vary from community to community. This is especially true in the case of statewide greenways and trails, many of which will travel through a number of cities and/or counties.

Non-consumptive fees

Non-consumptive fees are another potentially important source of revenue from greenway conservation. (See the chart, page 6.) These are fees collected from companies that want to use greenway land for commercial purposes that



won't interfere with the fundamental purpose of a greenway or trail. These commercial uses usually come in the form of purchase of rights-of-way easements for physical infrastructure such as telephone cable, fiber-optic communication cable, cable television wire, gas pipelines, sanitary sewers, electric transmission and distribution lines, and water transmission lines.

Pest control and pollination

Natural pest control systems and pollination by insects and wild animals are important to the production of food all over the world. These services include the control of pests by their natural enemies — predators, parasites, and pathogens — and the pollination of plants by insects, birds, bats and other animals. Diminishing pest control and pollination services (due to the continued destruction of natural habitat) add to the cost of food by making the use of pesticides more prevalent and by reducing production. Conserving greenways can help maintain plant and animal biodiversity and abundant natural habitat that are necessary for natural pest control and pollination.

Economic costs

Of course, greenways and trails are not free. Some of the economic costs associated with creating and maintaining greenways and trails include:

Development and operation

The economic costs of greenway and trail development and operation generally fall into five categories:

Analysis/study

Costs are associated with an assessment of the site, evaluation of proposal, etc. One example is the cost of conducting environmental liability assessments.

Lease/acquisition

Costs are associated with acquiring the right to use and develop the site. The primary costs here are the actual purchase or lease agreement, and



Acquisition costs of lands in 1997

Greenways and Conservation lands

<u>Location</u>	<u>Size</u>	<u>Acquisition cost</u>
Saddle Creek, Polk Co.	338 acres	\$597,000
Etoniah/Cross Florida Greenway, Putnam Co.	8,751 acres	\$6,628,300
Florida Springs Coastal Greenway, Citrus Co.	25,886 acres	\$34,243,343
North Fork St. Lucie River, St. Lucie Co.	981 acres	\$1,387,400
Rainbow River, Marion Co.	884 acres	\$7,982,800
Upper Black Creek, Clay Co.	12,378 acres	\$17,033,828
Wacissa/Aucilla River, Jefferson Co.	13,179 acres	\$4,637,536
Pine Island Ridge, Broward Co.	100 acres	\$3,566,349
Wekiva-Ocala Greenway Corridor, Lake Co.	1,904 acres	\$1,450,000

Source: Conservation and Recreation Lands 1997 Annual Report

Water Management District lands

Alafia River Corridor, Hillsborough & Polk Cos.	2,555 acres	\$3,762,699
Upper St. John's River Basin, Seminole Co.	7,663 acres	\$8,000,000
St. Joe Tract (Econfina Creek), Bay & Washington Cos.	3,752 acres	\$7,484,000

Source: Water Management District 5-year Plans (1995-1997)

the cost of a professional property survey. (See the chart above.) This category may also include the costs of creating, revising, and complying with plans required by outside organizations (such as other levels of government or private organizations), and any other future financial obligations arising from site lease or acquisition. If localities want to purchase the land, each piece of property must have a property survey performed by a registered professional land surveyor.



Trail development

Blackwater Heritage Trail \$314,300 per mile
12-ft width of asphalt, raised limerock bed, 3+ mile,
8-ft width parallel dirt horse trail, 7 trestles, reinforced
embankments, 3 trail heads.

Gainesville-Hawthorne Trail \$136,400 per mile
10-ft width of asphalt, limerock base, 8-ft wide parallel dirt
horse trail, 2 trail heads.

General James A. Van Fleet Trail \$60,740 per mile
12-ft width asphalt, 8-ft width parallel horse trail,
2 trail heads.

Source: Florida DEP

Florida National Scenic Trail \$7,000 per mile
Primitive earthen path, biological and archeological
evaluation, public scoping.

Source: U.S. Forest Service



Operation/Maintenance

Trails	Size	Annual Expense
Pinellas Trail	34 miles	\$561,000
Blackwater Heritage State Trail	9 miles	\$46,000
Florida National Scenic Trail	150 miles	\$52,500

Greenways and conservation lands

Wekiva-Ocala Greenway	19,000 acres	\$135,000
Etoniah/Cross Florida Greenway	8,000 acres	\$185,402

Water Management Districts \$6/acre

Game and Fresh Water Fish Commission

CARL lands	\$7.20/acre
non-CARL lands	\$1.08/acre

Division of Forestry \$30.00/acre

Division of Recreation & Parks \$30 - 100 /acre

Construction/labor

Costs are associated with site design, site development, structural improvements, and infrastructure connections. These costs include the construction of trails and physical structures such as trail-head facilities, including restrooms and providing drinking water. (See the chart, left.) However, these costs may be partially offset by local job creation arising from the construction of facilities.

Operation/maintenance

Costs arising from operation and maintenance depend almost entirely on design considerations and the scale of structural improvements made to the site. (See the chart below.) The general rule is that anything that is built will have to be maintained. Like site development, these costs may be offset somewhat by local job creation.

Marketing

Costs are associated with marketing greenways and trails to both local and non-local users. The initial task is to determine how much exposure is wanted or needed.

Decreased property tax revenues

This economic cost assumes that a site was subject to property taxes before the greenway was created, and that it will no longer be subject to property taxes afterward. Whether there is a cost to local government depends on who owns the property before and after, and whether an agreement is reached about compensation for property taxes.

Opportunity costs

The most site-specific economic cost is the "opportunity cost" of setting aside a piece of land as open space instead of using it for some other purpose, such as residential housing, offices or commercial establishments, or agriculture. The fundamental question is: What are the mostly likely uses of this parcel if it is not used for a greenway, and what benefits will be lost if these alternatives are not pursued?



Human/cultural impacts

Human/cultural impacts are those resulting from the interaction of the community with greenways and trails.

Although these impacts are largely ignored in existing evaluations of greenways and trails, they have been identified by scholars from a variety of disciplines, including land planning and outdoor recreation, alternative transportation, and environmental management. In contrast to economic and ecological costs, a number of human/cultural costs have been assessed in previous evaluations of corridors. Studies of greenways with trails in urban areas often ask trail users and property owners about nuisances such as crime, noise, and litter.

Human/cultural benefits

Greenways and trails provide many benefits to people, both to individuals and to the community as a whole. These include:

Aesthetic beauty

Like community pride, aesthetic beauty is a matter of perception. A number of authors have suggested ways to measure the visual quality attributes of open space. These include the use of experts, community perception, or other subjective approaches, such as a scenic inventory. Individual preferences for landscapes can be assessed through a visual preference survey, where individuals are asked to choose between pictures of different landscapes.

Recreation

In communities across the country, greenways with trails serve as close-to-home recreation areas for bicyclists, walkers, joggers, equestrians, roller bladers, people in wheelchairs, hikers, bird-watchers, parents with strollers,

picnickers, and people who just want to sit in the sunshine. Greenways along rivers, lakes and the coast provide access to canoers, kayakers and sailing enthusiasts. Downtown greenways provide places for farmers markets, open-air concerts, model plane demonstrations and other community gatherings.

Physical health and fitness

Greenways and trails provide places where people can run, walk, ride bicycles or horses, roller blade, or practice their Tai Chi exercises. They serve as alternative transportation routes for commuting to work, school or local businesses, and often make excellent “outdoor gyms” where people can exercise in a natural setting.

Community pride

Greenways and trails can provide a “sense of place,” and when integrated with other features of the community, such as historic sites, commercial or residential areas, and parks, are thought to improve the overall character of a region.

Flood control

In many communities, rainstorms bring on localized flooding when water accumulates on roads, parking lots and other solid surfaces.



Greenways can help reduce flooding by maintaining natural flood ways where stormwater can accumulate and then seep naturally into the aquifer.

Education and appreciation

Greenways and trails provide both a place to learn about the natural environment and historical and cultural sites, and a tool that can increase our awareness of and appreciation for open space. They are excellent outdoor classrooms where both children and adults can learn about native plant and animal life, native ecosystems and ecological processes.

Scientific research

Greenways provide opportunities for scientific research. The study of landscape ecology provides a way to learn about ecological processes, structures, and functions as well as the interaction and impact of the system with humans.

Preservation

Designating a site as a greenway or trail may help preserve its natural state from unplanned development that might disrupt, change or degrade it. Protecting greenways and trails also gives many people a sense of stewardship, the feeling that they have done something important, both for themselves and for future generations.

Benefits to the community

The 1992 National Park Service study of the Heritage, St. Marks and Lafayette/Moraga Trails found that both trail users and adjacent landowners believed these three greenways with trails provided important benefits to the community in the areas of health and fitness, aesthetic beauty, community pride, environmental education and recreation. Like the trail users, property owners along all three trails believed that health and fitness were the largest communal benefits provided.

Human/cultural costs

The majority of human/cultural costs that have been identified concern the incorporation of a trail into an existing natural space. Most of these perceived costs disappear under closer scrutiny. Some of the most common concerns include:

Crimes against people

While the possibility of attacks on people using secluded trails is often cited as a concern in discussions about greenway and trail conservation, the truth is that greenways with trails generally have very low crime rates. The most comprehensive study on the incidence of crime at 372 rail-trails across the United States was published in 1998 by the Rails-to-Trails Conservancy. Overall, the study shows that rail-trails are safe places for people to recreate. (See the chart on the next page.) In 1995, only eleven of 372 rail-trails experienced any type of major crime, such as mugging, assault, rape and murder. When contrasted with general major crime statistics in urban, suburban and rural areas, rail-trails have experienced very low major crime rates.



Crimes against property

People often are concerned about crimes such as trespassing, burglary and vandalism. But studies consistently report no increase in crimes against property that can be attributed to a specific greenway or trail, and that support by property owners for greenways and trails generally increases over time.

A 1978 study of the Lafayette/Moraga Trail near San Francisco found that more than 60 percent of property owners surveyed reported no problems due to the presence of the trail. The problems most commonly related by property owners were trespass and motor vehicle use of the trail. This study concluded that most property owners believed there were *fewer* problems after creation of the trail than before, and 92 percent felt the trail had either improved or had no effect on the quality of their neighborhoods. These findings are consistent with those reported in more recent studies of the Burke-Gilman Trail in Seattle, and the Weir Gulch, Highland Canal, and Willow Creek Trails in Denver. The Seattle study revealed that homes bordering the trail actually had lower rates of burglary and vandalism than the neighborhood average. Similarly, the 1995 study of three neighborhood greenways with trails in the metropolitan Denver area reported that the greenways had no effect on crime or trespass on area properties.

The level of crime related to the Lafayette/Moraga Trail was reexamined by the National Park Service in its 1992 study, and neighborhood perceptions of problems due to crime and/or nuisances were largely unchanged from the 1978 report. This trail passes through heavily developed, often affluent, suburban areas for most of its length, crossing numerous small and medium-sized roads and residential streets. Long sections are situated between the backyards of hundreds of private, single family homes, increasing the likelihood of impacts from greenway-related crime and nuisances, such as noise, litter, and trespass. The 1992 study reported that few adjacent or nearby property owners reported increased problems (noise, loitering, litter, trespassing, burglary, etc.) attributable to the trail. However, property owners along this trail



Myths/Realities

Myth: Development of a greenway with a trail will lead to increased crimes against property.

Reality: Studies consistently report no increase in crimes against properties that can be attributed to a specific greenway.

Myth: Development of a greenway with a trail will lead to increased crimes against people.

Reality: Studies of trails across the country show the incidence of crimes against people to be very low. Out of 372 rail-trails looked at in 1996, only 11 experienced any type of major crime.



Crime rates: comparing statistics for the nation vs. rail-trails

Rates from 1995 per 100,000 population/users

Crime	Urban		Suburban		Rural	
	U.S.	Rail-Trails	U.S.	Rail-Trails	U.S.	Rail-Trails
Mugging	335	0.53	102	0.00	19	0.00
Assault	531	0.58	293	0.02	203	0.01
Forcible rape	43	0.04	29	0.00	26	0.01
Murder	11	0.04	4	0.01	5	0.01

Sources: FBI Uniform Crime Reports, 1995 Rails-to-Trails Conservancy



Rail-Trails reporting minor crimes

Crime	Urban	Suburban	Rural
Burglary	0%	.01%	.01%
Trespassing	5%	3%	4%
Graffiti	26%	17%	12%
Littering	24%	24%	25%
Sign damage	22%	22%	23%
Unauthorized motorized use	18%	14%	23%

A total of 36 urban, 82 suburban and 254 rural rail-trails were surveyed in 1995.

Source: Tracy and Morris (1998)

did report slightly more problems (especially noise) than did owners along the more rural trails. Almost no adjacent or nearby property owners reported increased problems attributable to either the St. Marks or Heritage trails.

A similar result was observed in a 1990 U. S. D. A. Forest Service study of 19 trails in Illinois. While the study found that typical users did not perceive problems, respondents from urban settings reported slightly greater perceptions of problems than did those from suburban and rural greenways.

Incidences of minor crimes at the same 372 rail-trails reported in the Rails-to-Trails Conservancy study are shown in the chart above. This study cites several local law enforcement agencies that state heavy trail usage acts as a crime *deterrent* in formerly isolated areas.

Traffic congestion

People often think that heavily used greenways with trails will increase traffic on the roads leading to them. Unfortunately, the perceived costs of traffic have not received the same level of attention as crime and trespassing in the greenways and trails literature. Few authors have attempted the kind of systematic analysis needed to draw conclusions about traffic impacts.



Ecological impacts

In contrast to economic impacts, which are human-centered, ecological impacts concern the effects greenways and trails have on natural systems. At a minimum, the conservation of open space may have a positive impact upon native biodiversity, and offer some protection for endangered and threatened species. These benefits are supported by the fact that greenways are often designed to link or to preserve key linkages between critical habitats, providing habitat and movement corridors for plants and animals. By preserving open space, greenways can protect critical watersheds and support local flood control efforts.

Ecological benefits

Some of the most well-documented ecological benefits derived from greenways include:

Preservation of native biodiversity

The conservation of open space is a critical element in preserving the biodiversity of native species. Biodiversity is a broad concept. According to Reed Noss and Allen Cooperrider, authors of the book *Saving Nature's Legacy*, biodiversity encompasses "the variety of living organisms, the genetic differences among them, the communities and ecosystems in which they occur, and the ecological and evolutionary processes that keep them functioning, yet ever changing and adapting". As more acres of open space are preserved, more native habitat is protected, providing a diversity of habitat for wildlife of all sorts. The potential for maintaining and improving biodiversity will vary depending on the particular ecosystem and its location, latitude, topography, soils, plants and animals.

The impact of greenways on biodiversity is often understood in the reverse, through studies that look at the consequences of *not* conserving open space. Loss of habitat is often considered the primary problem facing Florida's wildlife and plant communities. Reductions in the amount of open space can be a particular problem for native species that are poorly adapted to human-dominated landscapes.

Preservation of rare/threatened/endangered species

Conserving greenways can help protect and nurture vulnerable native species by maintaining ecological processes and preserving the ability of genes, organisms, and communities to evolve over time. While it is generally acknowledged that single species approaches to protecting wildlife and their habitat do not constitute an effective overall conservation strategy, many scholars contend that some plant and animal species require greater attention than others.

Pollution control

Greenways can act as living filter systems that clean the air and water and modify climate. The primary pollution control benefits attributed to greenways are:

Air quality

The vegetation in greenways removes pollutants such as carbon dioxide and carbon monoxide from the air, trapping these harmful gases and releasing beneficial oxygen into the atmosphere.

Water quality

Greenways help maintain water quality by acting as natural filters, slowing the movement of flood waters, trapping sediments and organic matter from uplands, stabilizing banks to prevent erosion that can increase sediments, and moderating the temperature of surface waters.



The value of pollution control by land type

Values are for 1 hectare (2.47 acres)

Coastal land	\$12,568 per year
Wetlands	\$4,900 per year
Forest land	\$4,700 per year
Floodplains	\$3,200 per year

Source: Florida Preservation 2000 Land Acquisition Advisory Council, Florida DEP, 1997

Climate

Open forest or grasslands in urban areas reduce the effects of heat generated by pavement, and help moderate wind. Trees in particular can provide a cooling effect.

The value of the pollution control services provided by green spaces can actually be calculated in dollars. (See the chart, above.)



Maintaining/restoring habitat connections

Greenways can allow wildlife to move between large, prime habitat areas that would otherwise be isolated from one another. Many wildlife species are mobile and must be able to range for food, cover, and mates. Greenways can support the mobility of species by providing travel routes between large, prime habitats and by preserving key land and water resources.

A number of studies have found that interconnections or linkages between habitat areas can increase viability and provide continuity. With regard to plants, studies suggest that a minimum critical area is important, particularly in urban settings. The shape and size of the habitat patch in a floral system is important for movement. For animals, greenways can provide: habitat, buffers from human effects, links or bridges between habitats, refuge, structures for migration, and safety. Conservation biologists suggest that greenways improve native biodiversity primarily by decreasing the fragmentation of habitat.



Preserving watersheds

By preserving open space, greenways function as critical watershed protection. The protection of watersheds ensures that water supply and quality are maintained, both to the biologic system and to human communities. Preserving watersheds ensures the recharge of groundwater systems, and land conservation reduces water pollution by providing a natural water filter. Areas not covered by an impermeable surface (such as pavement or concrete) allow water to filter into the ground, recharging groundwater.

Ecological costs

The creation of greenways and trails may carry some ecological costs as well. Potential ecological costs include:

Spread of disease

The same corridors that support the travel needs of plants and animals can also provide travel routes for contagious disease. However, costs of this nature are generally related to the restoration of landscapes that have already been fragmented. Preserving pre-existing linked landscapes does not create *new* corridors of transmission for

disease. However, the introduction of trails may affect the potential spread of disease, not by providing corridors but by attracting unusual numbers of some species because of human impacts such as feeding or littering. On the other hand, greenways may also provide the potential for a species to *escape* conditions that cause disease.

Invasion of exotics, hybridization, and predation

Because greenways are typically much longer than they are wide, they often are subject to a phenomenon known as the “edge effect,” a situation associated with the loss of core habitat. The greater the ratio of the edge to the interior, the greater the potential for invasion of exotics, predation, and hybridization. Ditches, roads, power line and pipeline clear cuts, dikes and firebreaks are also sources of increased edge.

Increased predation often occurs in edge areas. Species drawn to these areas are often more aggressive predators than are interior species due to the highly competitive environment of the edge. Where “edges” already exist, public access via trails may actually reduce predation by frightening off predators. In some instances, predation can be desirable when it controls nuisance animals like rats.

A greenway may invite human uses that are incompatible with the needs of plants and animals. Some greenways might already harbor invasive, non-native species, thus providing a continuous conduit to ecological hubs. The introduction of exotic plant and animal species in areas can drive out native species. It can also result in hybridization when species are introduced that are similar genetically to native species and thus able to breed with them.

Fragmentation

When trails are introduced where none previously existed, there may be some fragmentation of the natural habitat. Roads and trails bisecting an ecosystem can isolate some areas. These isolated patches can potentially become “mortality sinks,” low quality areas that do not provide a means of escape or allow the dispersal of the gene pool. In some cases, greenways with trails can create barriers to species movement if the area is already a key movement corridor which then becomes fragmented by trails. Of course, conservation of a greenway with a trail is much less a barrier to species movement than other development alternatives such as industrial, commercial, or residential land uses.

Soil erosion

Erosion can occur along trails when use is not managed properly. Soil erosion caused by trail degradation (due to unpaved trails or non-sanctioned, off-trail human traffic) can affect the health of plants and lead to sedimentation of streams.

Human impact on wildlife

If a completely natural open space is altered to accommodate people, there is a potential negative impact on wildlife. Potential impacts from recreational activities include:

Habitat modification

Trampling can lead to loss of vegetation and organic materials, as well as soil erosion.

Disturbance/harassment

Trail use and camping in critical habitat areas and photographers pursuing wildlife can cause excitement, stress, severe exertion, disturbance of activities such as mating, nesting and feeding, and even death.

Unnatural, unhealthy food dependencies

Feeding deer, bear, rodents or birds can alter their behavior and make them dependent on feeding.

Displacement

Trail use can force some animals away from their preferred habitats.

Analyzing greenways and trails

As communities across Florida look for new and innovative ways to conserve their ecological and historic heritage while accommodating growing populations, more and more are turning to greenways and trails.

Greenways and trails offer a new way of looking at how a community's cultural, historic, recreational and conservation needs fit into an overall picture that also includes economic growth. With their emphasis on connections, greenways and trails allow community leaders to consider how existing parks and open spaces can become part of a network of green that supports wildlife, pleases people, and attracts tourists and clean industry.

The decision to conserve a greenway or trail is not usually an “either or” proposition. In many places, greenways with trails are developed as part of an overall plan for a residential or commercial development, incorporating trailheads, restrooms and other amenities. In other places, greenways are left completely natural, and serve as buffers or conservation areas in their own right.

The question of trails

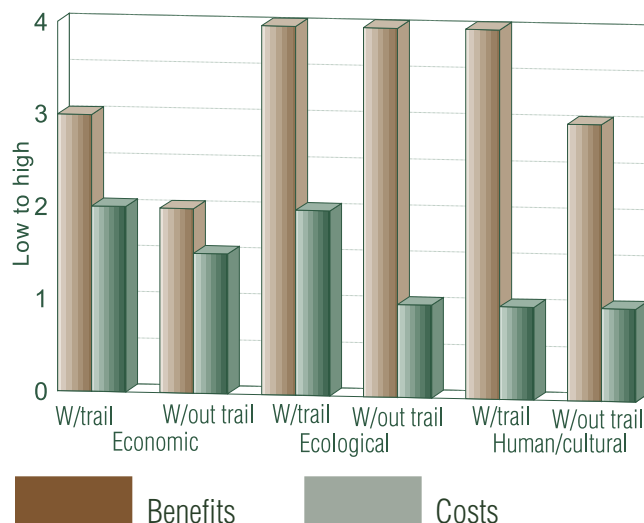
Once a decision has been reached to create some kind of greenway, the most important question becomes whether to add a trail and, if so, what kind of trail (either native soil, hardened soil or pavement.)

The graph below shows that most of the economic benefits associated with greenways come from trail use. Greenways with trails offer opportunities for users to rent skates, bicycles or horses, and purchase things like food and other supplies. However, it does cost more to develop and maintain a trail, so economic costs will also be greater.

Ecological benefits are generally the same for a greenway with a trail as for one without. Ecological costs will be slightly higher for greenways with trails because trails usually cause at least some erosion problems and may disturb wildlife or its habitat.

Of course, the human/cultural benefits of a greenway rise significantly with the addition of a trail, because trails are what bring most people to a greenway site to recreate, exercise, learn about nature and relax in a natural setting.

A comparison of a greenway with a trail to a greenway without a trail



Using the worksheets

The worksheets on pages 21 and 22 are designed to help you evaluate and choose between two or more sites being considered as potential greenways. Worksheet #1 is for a greenway with a trail, Worksheet #2 for a greenway without a trail. You will need to complete a worksheet for each site being considered.

Here's how to fill them out:

Section 1: Look at the impact of each economic, ecological, and human/cultural benefit expected to result from the greenway, and



determine whether you think it will be high, medium or low. Circle the corresponding score in the “Level of Impact” column (3, 2 or 1) next to the benefit.

Now rank each benefit according to how important it is to your community. We have listed 27 benefits for a greenway with a trail, and 22 for a greenway without a trail. (You may choose to add or delete benefits that pertain directly to your community.) So if you are evaluating a greenway that would include a trail, rank each benefit in the worksheet from 27 down to one, with the benefit ranked 27 being the most important and that ranked as one being the least. Put that number in the column marked “Rank by Importance”.

Multiply the level of impact by the rank, and put that score in the final column. When you’re done, add up all the numbers in the final column to come up with a Total Benefits score.

Section 2: Consider the costs associated with your greenway site. First, determine its impact (high, medium or low) and circle the corresponding number in the “Level of Impact” column. Then assign each cost a number reflecting how important it is to your community. We have included 15 costs for a greenway with a trail, and nine for a greenway without a trail, so rank those costs from least tolerable to most tolerable (15 down to one on Worksheet #1, and nine down to one on Worksheet #2).

Multiply the level of impact by the rank, and put that score in the final column. When you’re done, add up all the numbers in the final column to come up with a Total Costs score.

Comparing sites

Once you've determined total benefit and total cost scores for each site, you can compare the total benefit scores of each, and the total cost scores. You can also subtract the costs from the benefits to obtain a single score for each greenway.

These worksheets are designed so that the total score of greenway costs will always be smaller than the total benefit score. This is not meant to imply that the benefits of greenways are always greater than the costs, only that the instrument details more benefits than costs. In addition, comparisons of this nature do not reveal whether either greenway will result in a net benefit to the community, only that one greenway provides a greater net benefit than the other.

The differences in these overall scores are likely to be small, and will depend heavily on

the level of impacts (low, medium, or high) you estimate in the first step. Your assessment of expected impacts will play a large part in determining which sites represent the best greenways for your community.

We encourage you to modify the worksheets to incorporate local experience or to allow more precise assessments. For example, you could change the scale of low, medium, and high used to measure greenway impacts to a seven-part, nine-part, or any other scale for a more precise assessment.

You also may want to modify the worksheets to enable more precise direct comparisons. Currently, the worksheets are designed to permit a large number of potential greenway sites to be evaluated and compared. However, you could perform more precise assessments of fewer greenways, such as one site directly compared to another.



Worksheet I: Greenway with a trail

Impact of a greenway with a trail	Circle level of impact			Multiply by	Rank by importance from 1 (least) to 27 (most)		Score
	High	Med	Low				
Economic benefits							
increased trail related expenditures?	3	2	1	X	_____	equals	_____
site development and restoration jobs created?	3	2	1	X	_____	equals	_____
user fees?	3	2	1	X	_____	equals	_____
increased property values?	3	2	1	X	_____	equals	_____
reduced public service requirements?	3	2	1	X	_____	equals	_____
reduced public infrastructure requirements?	3	2	1	X	_____	equals	_____
hazard mitigation and pollution control?	3	2	1	X	_____	equals	_____
local government bond rating increase?	3	2	1	X	_____	equals	_____
tax revenue from increased sales?	3	2	1	X	_____	equals	_____
tax revenue from increased property values?	3	2	1	X	_____	equals	_____
non-consumptive fees: utility, pipeline, cable rights-of-way?	3	2	1	X	_____	equals	_____
natural pest control, pollination for agriculturalists?	3	2	1	X	_____	equals	_____
Human/cultural benefits							
aesthetic beauty?	3	2	1	X	_____	equals	_____
multiple recreation opportunities?	3	2	1	X	_____	equals	_____
physical fitness and health?	3	2	1	X	_____	equals	_____
community pride in a well-maintained, marketed greenway?	3	2	1	X	_____	equals	_____
flood control and aquifer recharge?	3	2	1	X	_____	equals	_____
opportunities for outdoor education and appreciation?	3	2	1	X	_____	equals	_____
opportunities for scientific research?	3	2	1	X	_____	equals	_____
preservation of forests, open space, rivers, lakes?	3	2	1	X	_____	equals	_____
opportunities for cultural and historical preservation?	3	2	1	X	_____	equals	_____
Ecological benefits							
preservation of native biodiversity/unique ecosystem?	3	2	1	X	_____	equals	_____
preservation of rare, threatened or endangered species?	3	2	1	X	_____	equals	_____
pollution control: air, water, and climate?	3	2	1	X	_____	equals	_____
connectivity of otherwise fragmented natural lands?	3	2	1	X	_____	equals	_____
maintains hydrologic system?	3	2	1	X	_____	equals	_____
provides critical buffering function?	3	2	1	X	_____	equals	_____
					Total score _____		
Economic costs							
fees for analysis and environmental liability audit?	3	2	1	X	_____	equals	_____
deed/lease acquisition from many property owners?	3	2	1	X	_____	equals	_____
development, operation and maintenance of facilities?	3	2	1	X	_____	equals	_____
marketing costs?	3	2	1	X	_____	equals	_____
decreased property tax revenues?	3	2	1	X	_____	equals	_____
opportunity costs of likely alternative land use?	3	2	1	X	_____	equals	_____
Human/cultural costs							
alternative land use that is culturally/historically unique?	3	2	1	X	_____	equals	_____
crimes against people?	3	2	1	X	_____	equals	_____
crimes against property?	3	2	1	X	_____	equals	_____
traffic congestion?	3	2	1	X	_____	equals	_____
Ecological costs							
spread of disease?	3	2	1	X	_____	equals	_____
invasion of exotics, hybridization and predation?	3	2	1	X	_____	equals	_____
fragmentation?	3	2	1	X	_____	equals	_____
soil erosion?	3	2	1	X	_____	equals	_____
recreation impacts on wildlife?	3	2	1	X	_____	equals	_____
					Total score _____		

Worksheet 2: Greenway without a trail

Impact of a greenway without a trail	Circle level of impact			Multiply by	Rank by importance		Score
	High	Med	Low		from 1 (least) to 22 (most)		
<i>Economic benefits</i>							
site development and restoration jobs created?	3	2	1	X	_____	equals	_____
increased property values?	3	2	1	X	_____	equals	_____
reduced public service requirements?	3	2	1	X	_____	equals	_____
reduced public infrastructure requirements?	3	2	1	X	_____	equals	_____
hazard mitigation and pollution control?	3	2	1	X	_____	equals	_____
local government bond rating increase?	3	2	1	X	_____	equals	_____
tax revenue from increased property values?	3	2	1	X	_____	equals	_____
non-consumptive fees: utility, pipeline, cable rights-of-way?	3	2	1	X	_____	equals	_____
natural pest control, pollination for agriculturalists?	3	2	1	X	_____	equals	_____
<i>Human/cultural benefits</i>							
aesthetic beauty?	3	2	1	X	_____	equals	_____
community pride in a well-maintained, marketed greenway?	3	2	1	X	_____	equals	_____
flood control and aquifer recharge?	3	2	1	X	_____	equals	_____
opportunities for outdoor education and appreciation?	3	2	1	X	_____	equals	_____
opportunities for scientific research?	3	2	1	X	_____	equals	_____
preservation of forests, open space, rivers, and lakes?	3	2	1	X	_____	equals	_____
opportunities for cultural and historical preservation?	3	2	1	X	_____	equals	_____
<i>Ecological benefits</i>							
preservation of native biodiversity/unique ecosystem?	3	2	1	X	_____	equals	_____
preservation of rare, threatened, endangered species?	3	2	1	X	_____	equals	_____
pollution control: air, water and climate?	3	2	1	X	_____	equals	_____
connectivity to otherwise fragmented natural lands?	3	2	1	X	_____	equals	_____
maintains hydrologic system?	3	2	1	X	_____	equals	_____
provides critical buffering function?	3	2	1	X	_____	equals	_____

Total score _____

						Rank from 1 (least) to 9 (most)		
<i>Economic costs</i>								
fees for analysis and environmental liability audit?	3	2	1	X	_____	equals	_____	
deed/lease acquisition from many property owners?	3	2	1	X	_____	equals	_____	
development, operation and maintenance of facilities?	3	2	1	X	_____	equals	_____	
marketing costs?	3	2	1	X	_____	equals	_____	
decreased property tax revenues?	3	2	1	X	_____	equals	_____	
opportunity costs of likely alternative land use?	3	2	1	X	_____	equals	_____	
<i>Human/cultural costs</i>								
alternative land use that is culturally/historically unique?	3	2	1	X	_____	equals	_____	
<i>Ecological costs</i>								
spread of disease?	3	2	1	X	_____	equals	_____	
invasion of exotics, hybridization and predation?	3	2	1	X	_____	equals	_____	

Total score _____

Resources

These are some of the best sources available for information about the benefits and costs of greenways:

Conservation Design for Subdivisions: A Practical Guide to Creating Open Space Networks. Arendt, Randall. (1996). Washington, DC.: Island Press.

This book presents a simple, practical step-by-step approach to designing subdivisions around open space, and shows how communities can adopt new standards in their plans and ordinances to ultimately produce an interconnected network of conservation lands.

Views from the Road: A Community Guide for Assessing Rural Historic Landscapes. Copps, David H. (1995). Washington, D.C.: Island Press.

Provides in-depth discussion of: the definition and measurement of visual preferences; how to design and perform an inventory of historic landscape; and an evaluation method that ranks and values the important criteria for preservation.

Closing the Gaps in Florida's Wildlife Habitat Conservation System. Cox, James, et al. (1994). Tallahassee, FL: Office of Environmental Services, Florida Game and Fresh Water Fish Commission.

This report details habitats and species that are important to Florida's biodiversity.

Greenways: A Guide to Planning, Design, and Development. Flink, Charles A., and Robert M. Searns. (1993). Washington, DC: Island Press.

This excellent book spans the formation of a greenway from the creation of a vision and plan for development, through establishment of partnerships and public support, to funding.

The Illinois Statewide Trail User Study. Gobster, Paul H. (1990). Rails-To-Trails Conservancy. Chicago: U.S. Forest Service.

A study of recreational use patterns along trails in Illinois. The study employed surveys of 3,400 trail users from 19 trails throughout Illinois. The document notes that copies may be obtained from: Illinois Chapter, Rails-to-Trails Conservancy, 313 W. Cook St., Springfield, IL 62704.

"Priority-Setting Methods for Plural Policymaking Bodies." Grizzle, Gloria (1985). Administration & Society. Vol. 17: 331-359.

This survey article reviews a number of methods that plural policy making bodies can use for setting priorities.

Landscape Linkages and Biodiversity. Hudson, Wendy E., editor. (1991). Washington, D.C.: Island Press.

The book is a collection of chapters written by well known authors in the field of biological conservation. The chapter by Hay on "Greenways and Biodiversity" gives a concise view of the importance of incorporating ecological aspects in the greenways design.

The Impacts of Rail-Trails: A Study of Users and Nearby Property Owners from Three Trails. Moore, Roger, et al. (1992). U.S. Department of Interior.

This study reports the economic benefits and impacts of rail-trails through surveys of users and property owners at the Heritage Trail, in Iowa; the St. Marks Trail in Florida; and the Lafayette/Moraga Trail in California.

Ecosystems of Florida. Myers, Ronald L. and John J. Ewel, editors. (1990). Orlando, FL: University of Florida Press.

This is one of the most concise and informative looks at the different types, functions, and importance of Florida ecosystems.

Economic Impacts of Protecting Rivers, Trails, and Greenway Corridors. National Park Service (1995). Washington, D.C.: GPO.

This book looks at different methods and models for the evaluation of economic impacts and benefit estimation: property values, expenditures, tourism, corporation attraction, reduction of public costs, and recreation benefits.

Trails for the Twenty-First Century: Planning, Design, and Management Manual for Multi-Use Trails. Ryan, Karen-Lee (1993). Rails-to-Trails Conservancy. Washington, D.C.: Island Press.

A manual for planning, designing, and managing multi-use trails.

Ecology of Greenways: Design and Function of Linear Conservation Areas. Smith, Daniel S. and Paul Cawood Hellmund, editors. (1993). Minneapolis, MN: University of Minnesota Press.

This is one of the most readable books available on greenway design, development, and management from an ecological perspective.

Rail-Trails and Safe Communities: The Experience on 372 Trails. Tracy, Tammy and Hugh Morris. (1998). Rails-to-Trails Conservancy. Washington, D.C.: National Park Service.

This study chronicles crime statistics on all known U.S. rail-trails.



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